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Observations on the African Bushpig  
*Potamochoerus porcus* Linn. in Rhodesia

LYLE K. SOWLS<sup>1</sup> AND ROBERT J. PHELPS<sup>2</sup>

(Plates I-II; Text-figures 1-8)

INTRODUCTION

**A**LTHOUGH the African bushpig is widely distributed and locally abundant it is one of the continent's least known large mammals. Its elusive habits and the fact that it feeds mostly at night make it better known by its trail of damaged crops than by its appearance. Consequently, except for records on museum specimens which are relatively scarce, very little factual information has been published on this mammal.

This paper is an attempt to bring together most of the existing knowledge of the bushpig and to add new information based largely on experience with animals raised in captivity.

METHODS OF STUDY

In November, 1962, farmers in the Salisbury area of Rhodesia were asked through radio and newspapers to notify us of any young bushpigs found in the area. Seventeen young bushpigs, taken from six litters, were obtained in this way and held in captivity for periods of 13 to 26 months. Of this group all but two survived and flourished. At the beginning these animals were weighed and measured and their teeth examined at weekly intervals. As they became larger they were weighed and measured only once monthly.

<sup>1</sup>Arizona Cooperative Wildlife Research Unit, University of Arizona, Tucson, Arizona.

<sup>2</sup>Agricultural Research Council of Central Africa, Pax House, Salisbury, Rhodesia.

To obtain skulls from pigs of known age the animals were sacrificed at various ages between 13 and 26 months.

Several farmers in the Salisbury, Mazoe, and Concession areas, where there are relatively high bushpig populations, cooperated by gathering weights and measurements of bushpigs killed. One hundred and thirty-seven skulls in the Bulawayo Museum were examined to obtain information on tooth eruption, presence or absence of premolars, and reliability of the extension of the maxilla for sex determination.

FINDINGS

*Dentition and Replacement*

*Normal Dentition.*—The total number of teeth for a normal bushpig can vary from 40 to 44 according to the following formula:

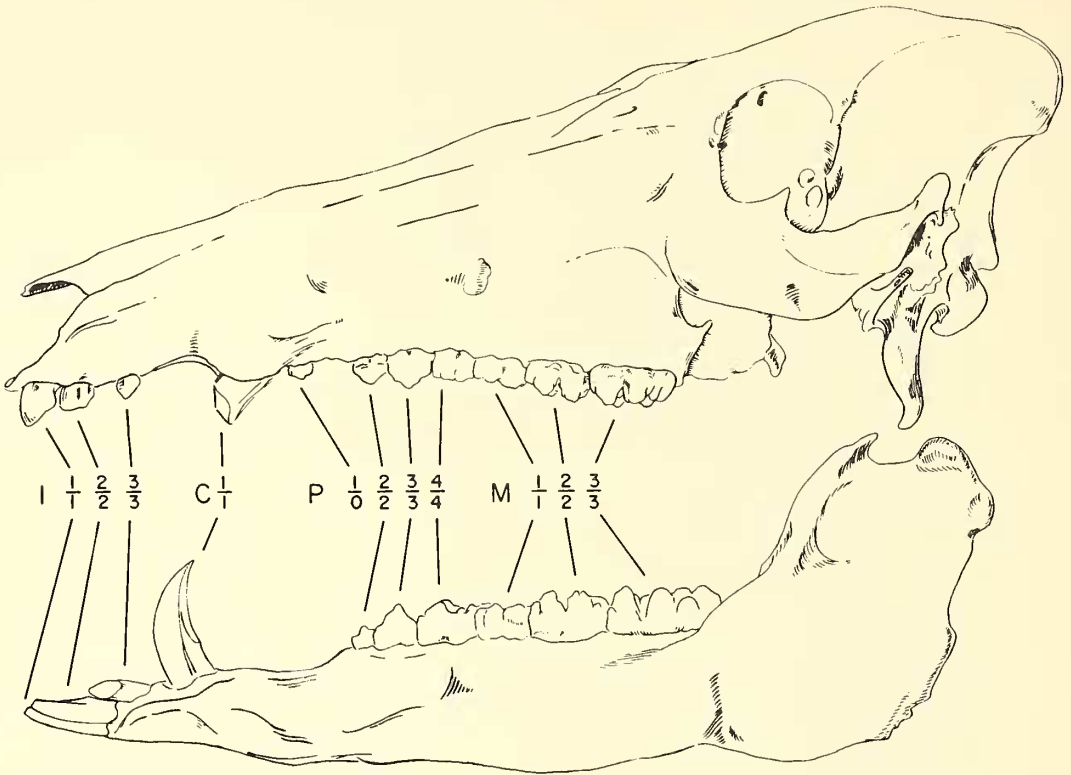
$$\text{Incisors} = \frac{3}{3} ; \quad \text{Canines} = \frac{1}{1} ; \quad \text{Premolars} = \frac{3 \text{ or } 4}{3 \text{ or } 4} ;$$

$$\text{Molars} = \frac{3}{3} \times 2 = 40, 42 \text{ or } 44$$

Ninety-two skulls of adults were examined. Of this number, 73, or 79.3 percent, had 42 teeth; 16, or 17.4 percent, had 40 teeth; and only 3, or 3.2 percent, had 44 teeth.

For purposes of our study we numbered the teeth as shown in Text-figure 1. This drawing represents the most common situation where the upper first premolars, but not the lower, are present.

The tusks or canine teeth of the bushpig are



TEXT-FIG. 1. Normal dentition of the African bushpig and system of labeling individual teeth.

not nearly as long and conspicuous as those of the warthog (*Phacochoerus aethiopicus*). The lower canine is generally larger than the upper and is sharpened by wearing action against the upper canine.

Measurements were obtained of both upper and lower tusks of both males and females. Upper tusks of 23 males averaged 20.4 mm. and of 14 females 17.4 mm. These figures were ( $t=1.41$  Tab. t. 05 for 35 d. f. = 2.03) not significantly different. However, the lower tusks of 29 males which averaged 47.5 mm. in length were found to be significantly longer than 16 lower tusks of females which averaged 41.4 mm. in length ( $t=5.79$ , Tab. t. 01 for 43 d. f. = 2.69).

*Order of Eruption and Replacement of Teeth.*—At birth the bushpig normally has all four temporary canines and the upper and lower third incisors. The third premolar is the next temporary tooth to erupt in both the upper and lower jaw. The first incisor in both jaws follows at nearly the same time as the fourth temporary premolar. The second premolar follows this. The last temporary tooth to erupt is the second incisor. By 15 to 17 weeks the temporary dentition is complete. At this time the first permanent tooth to erupt is the first lower molar, followed

shortly by the first upper molar. At about 43 to 45 weeks the permanent canines begin to appear. The upper canines appear about two weeks ahead of the lower. The ages at which the various teeth first appeared in the 15 captives are summarized in Table I.

#### *Weights and Measurements*

Only meager information on the size of wild bushpigs has been published. A review of the weight and body measurement data found in the literature is summarized in Table II. Table III gives the weights and standard measurements for ten wild bushpigs examined in Rhodesia during 1962 and 1963. The field-dressed weight is that of the head, skin, and body after heart, lungs, and other viscera have been removed.

#### *Growth*

No data have been published on the growth rate of wild, free-ranging bushpigs. In 1962 and 1963 we were able to raise 15 bushpigs from a few weeks of age, when they were taken from the nest. Weights and standard measurements were taken at periodic intervals. These animals were given canned milk and water when very young and slowly transferred to a commercial-

TABLE I  
TOOTH DEVELOPMENT OF THE AFRICAN BUSHPIG AS DETERMINED  
BY PERIODIC EXAMINATIONS OF CAPTIVE ANIMALS

	<i>Temporary Teeth</i>			<i>Permanent Teeth</i>		
	<i>(Age at Tooth Eruption in Weeks)</i>			<i>(Age at Tooth Eruption in Weeks)</i>		
	No. Animals	Range	Mean	No. Animals	Range	Mean
<i>Upper Jaw</i>						
Incisors, 1st	9	7-9	7.7	2	71-75	73.0
2nd	10	11-17	13.8	1	95	...
3rd		In at birth				
Canines		In at birth		12	36-49	43.6
Premolars, 1st		No temporary tooth		13	30-41	33.1
2nd	12	9-15	11.8	3	71-78	74.4
3rd	9	4-6	5.0	3		
4th	9	8-12	9.8	3		
Molars, 1st		No temporary tooth		13	21-26	24.5
2nd		No temporary tooth		5	56-68	61.0
3rd		No temporary tooth				
<i>Lower Jaw</i>						
Incisors, 1st	9	3-7	5.5	2	72-75	73.5
2nd	10	9-14	10.8	1	88	...
3rd		In at birth				
Canines		In at birth		10	45-53	47.8
Premolars, 1st		No temporary tooth		none	?	?
2nd	7	11-16	12.8	3	71-78	74.4
3rd	9	4-6	5.0	3		
4th	8	8-12	9.6	3		
Molars, 1st		No temporary tooth		14	20-26	22.8
2nd		No temporary tooth		4	56-68	63.0
3rd		No temporary tooth				

TABLE II  
WEIGHTS AND BODY MEASUREMENTS OF BUSHPIGS AS DESCRIBED IN THE LITERATURE

<i>Area of Collection</i>	<i>Approx. Age</i>	<i>Sex</i>	<i>Weight (lbs.)</i>	<i>Head</i>					<i>Reference</i>
				<i>Body</i>	<i>Shoulder Height</i>	<i>Hind Foot</i>	<i>Ear</i>	<i>Tail</i>	
S. Africa	Adult	M	...	50.5	...	10.5	6.0	14.7	Shortridge (1934)
Kenya		M	...	51.0	...	10.5	5.5	14.0	
Zambia		F	171	47.4	25.5	10.2	6.8	15.5	Ansell (collector), Bulawayo Museum
S. Africa		M	...	51.1	...	8.9	...	12.4	Roberts (1951)
		M	250	...	...	...	...	...	Shortridge (1934)
		F	200	...	...	...	...	...	
	...	..	235	...	...	...	...	...	Shortridge 1934 from Kirby
Zambia	...	M	175	...	...	...	...	...	Robinette (1963) from Ansell
	...	F	135	...	...	...	...	...	
	...	F	122	...	...	...	...	...	Robinette (1963) from Benson

type hog feed given twice daily. Text-figure 2 shows the rate of gain of males and Text-figure 3 gives the rate of gain of the females. An approximate rate of growth is represented by the curved line which has been drawn by inspection.

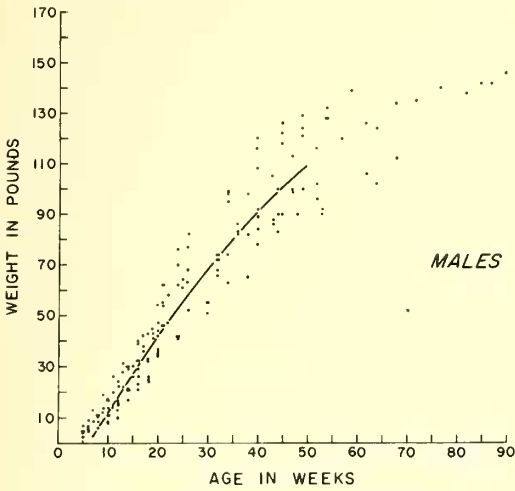
When they were first obtained animals were kept in small pens about ten feet square, at a rate of four or five animals per pen.

At about four months of age all 15 bushpigs were placed in one large pen with a total area of about 900 square feet, of which about 30 percent was sheltered.

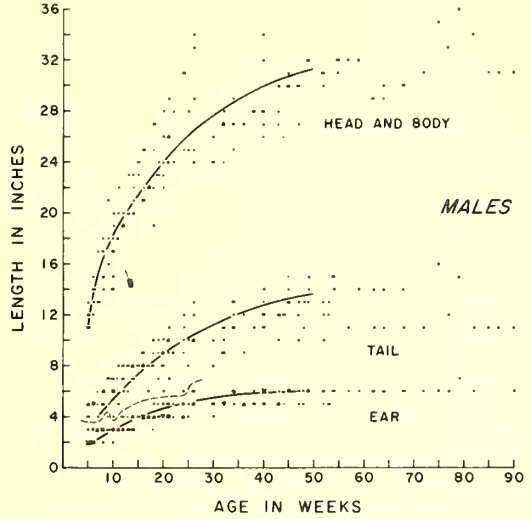
Growth curves were not plotted beyond the 50-week mark. Several factors made the data after this age less reliable. As the animals were sacrificed the number of values obtained for the

TABLE III  
WEIGHTS AND BODY MEASUREMENTS OF WILD BUSHPIGS FROM RHODESIA

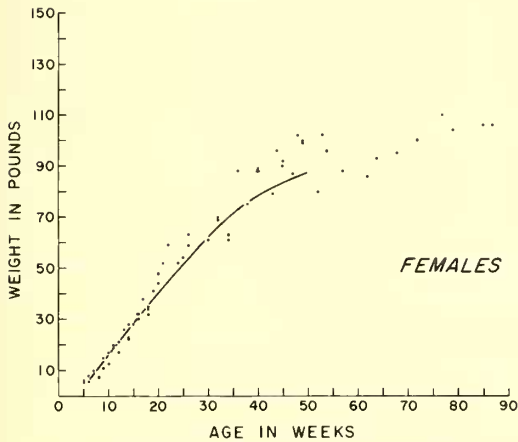
Area of Collection	Approx. Age	Sex	Weight (lbs)	Field-dressed Weight (lbs)	% Loss	Measurement in Inches						Collector or Measurer
						Head & Body	Shoulder Height	Hind Foot	Ear	Tail		
Concession, Rhodesia	Adult	F	155	114	26	47	27	10	6.75	12	Durand (collector)	
	.....	F	106	85	20	46	26.5	10.5	...	6.75	Peak (collector)	
	Adult	M	157	125	20	52	30.25	11.5	7.5	14	Maratos (measurer)	
	.....	F	116	90	24	45		10	5	14		
	3-4 mos.	F	22	17	23	25	14	6	3.75	7.5		
	Adult	M	144	118	18	51	31	11	7	17		
Near Salisbury, Rhodesia	Imm. about 1 yr.	F	98	76	24	36	24	10	5.25	14	Sowls (measurer)	
	Adult	M	101	81	20	38	23	10	5.5	14		
	Adult	M	183	149	19	48	29	10.5	6.25	...		



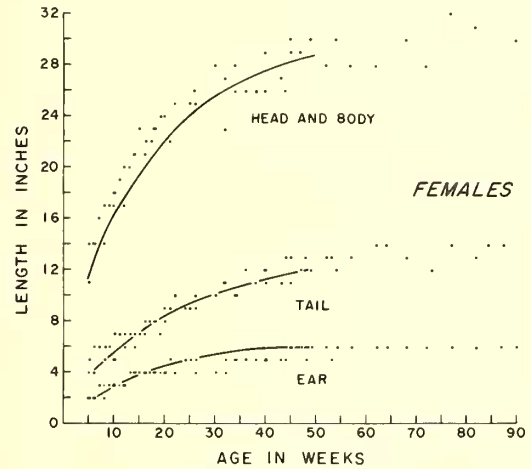
TEXT-FIG. 2. Rate of gain in weight of captive male bushpigs.



TEXT-FIG. 4. Rate of increase of head and body length, tail length, and ear length in captive male bushpigs.



TEXT-FIG. 3. Rate of gain in weight of captive female bushpigs.



TEXT-FIG. 5. Rate of increase of head and body length, tail length, and ear length in captive female bushpigs.

various ages became fewer and fewer; of the 15 animals obtained only four were females; the effects of the experimentation with trypanosomiasis were not known. Although the bushpig is a highly social animal and individuals appeared to be compatible, unequal gain in weight and general growth were probably caused by crowding, especially when the animals were over one year of age.

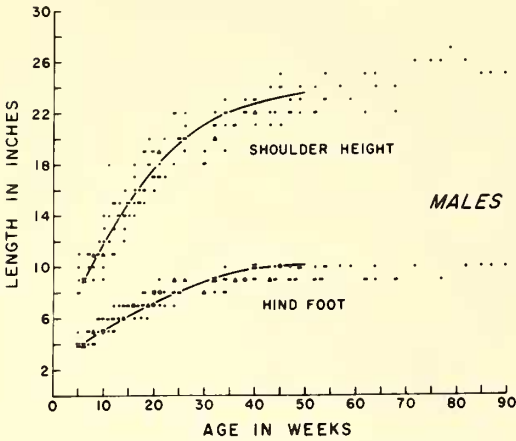
Text-figures 4 and 5 show the rate of increase in length of ear, tail, and length of head and body and Text-figures 6 and 7 give the rate of increase in hind foot length and shoulder height.

Both sexes showed a rather uniform rate of

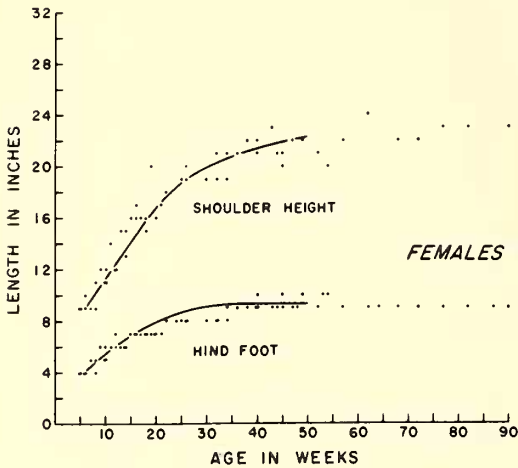
growth during the first year of life and gained weight at the rate of about two pounds per week.

Some indication of the meaning of the growth rates can be obtained by comparing them with the weights and measurements of wild animals. Old adults (Tables II and III) have been found to vary in weight by about 40 pounds. Two wild animals determined to be yearlings by the tooth eruption pattern weighed nearly the same as captive animals at the age of one year.

The increase in head and body measurements formed a steep curve until about 40 weeks. Com-



TEXT-FIG. 6. Rate of increase of height of shoulder and length of hind foot in captive male bushpigs.



TEXT-FIG. 7. Rate of increase of height of shoulder and length of hind foot in captive female bushpigs.

parisons with the figures on wild animals indicate that this measurement continues until much later in life than the 90 weeks which is represented by the oldest animals in Text-figures 4 and 5.

Shoulder height in both sexes began to decline in rate of increase among captive animals at about 30 weeks, and like the length of head and body did not show a definite flat curve at the 90 weeks at which the oldest animals were sacrificed in these investigations. Like the length of head and body the height at shoulder continues to increase slightly after 90 weeks.

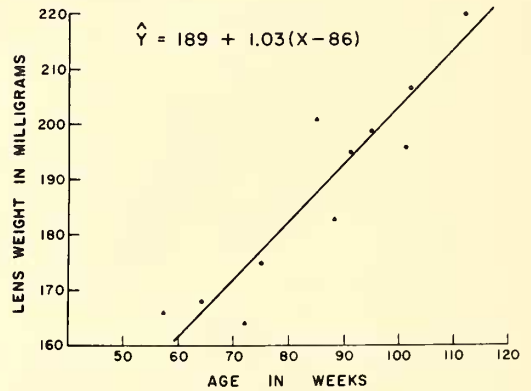
The length of hind foot and ear were the earliest to show a leveling off of the curve among

the captive animals and showed the least variation of all measurements.

The length of the tail among wild specimens was found to vary by about 30 percent. The flattening of the curve at about 50 weeks for the small number of captive individuals on which data were obtained apparently means that these particular individuals had already reached adult tail length.

*Lens Weight as an Index to Age.*—Among the Suidae and related forms, lens weight as an index to age has been studied in the warthog *Phacochoerus aethiopicus* by Child, Sows, and Richardson (1965) and the collared peccary *Pecari tajacu* by Richardson (1966).

Data on the lens weights of the bushpig are scarce. However, we are showing the weight-age relationship for the 12 sets of lenses from the captive bushpigs in Text-figure 8. The lens weight plotted is the average for the two lenses which were oven-dried and weighed to the nearest milligram.



TEXT-FIG. 8. Lens weight-age relationship in 11 specimens of bushpig.

*Determining Sex from the Skull.*—The male bushpigs can be distinguished from the female by a dorsal extension of the maxilla which extends from the base of the canine (Pl. I, Figs. 1 & 2). This process has been described by Roberts (1951), Shortridge (1934), and other writers. Of the 92 adult skulls examined in this study the record described all skulls with the process as males and all without it as females except one, which we suspect was incorrectly labeled.

#### Reproduction

*Breeding Season and Litter Size.*—Only meager information on reproduction in bushpigs ap-

pears in the literature. Asdell (1964) gives the gestation period as four months. Phillips (1926) says that in South Africa there is no definite breeding season and that litters generally number four. Fitzsimmons (1920), however, gives midsummer (December and January) as the period of parturition in South Africa. Shortridge (1934) quotes Kirby, who gave the same period and says litters are made up of five to six young. In Zambia, Ansell (1960a) says that records of recently born young are from October to March and that the litter sizes range from two to six with three to four the most common.

Among the specimens of bushpigs in the collection of the National Museum of Rhodesia at Bulawayo are 14 very young animals as follows: three from the same litter taken in Zambia on December 21, 1959, which were apparently collected when only a few weeks old; two from one litter collected by W. F. H. Ansell on February 10, 1950; three from one litter collected by B. O. Williams from Turk Mine in Rhodesia in July 1960, which according to the tooth pattern and measurements had apparently been born in March; three collected together at Nagupande, Rhodesia, on November 25, 1962; one collected near Salisbury on January 7, 1963, which was estimated to be about two weeks old; one from Zambia collected on January 25, 1961; and one collected by W. F. H. Ansell on March 30, 1956.

The records on time of parturition and litter

size obtained in this study are given in Table IV. Most of the farmers to whom we talked in the Mazoe-Salisbury-Concession area believed that most of the young bushpigs in that area were born between late November and about February 1. We conclude that in Rhodesia the principal parturition season is the same as Ansell has described for Zambia with the largest number of animals being born in November, December, and January. This period is during the summer rainy season when the food supplies and the young animals' chances for survival would be the best. This same type of timing of the parturition season and rainfall has been described by Sowls (1964) for another swinelike animal, the collared peccary.

One female in the captive herd gave birth to three young on November 30, 1964, at the age of 103 weeks. The mating in this instance, based on the four-month gestation period, would have occurred about August 1. At this time the sow was 86 weeks old.

The sow makes a large nest of grass for the young. These nests remain for many months in the heavy woodland and resemble a small weathered haystack. Most of the young that were captured for us were taken from the nests by African farm hands. Ansell refers to these nests as bowers.

Table V gives the weight and measurements of five young from two litters that were obtained

TABLE IV  
BIRTH DATES AND LITTER SIZE FOR INDIVIDUAL LITTERS

Locality	Date of Birth	Litter Size	Reference or Observer
Concession, Rhodesia	11-23-62	7	Keats
Mazoe, Rhodesia	11-23-62	?	Wheeler
	12-2-62	4+	Edwards
	12-10-62	4+	Bothma
	1-9-63	?	Douglas

TABLE V  
WEIGHT AND MEASUREMENTS FOR NEWLY BORN BUSHPIGS

Date	Sex	Est. Age in Days	Weight (Grams)	Flesh measurements mm.				
				Head & Body	Hind Foot	Shoulder Ht.	Tail	Ear
11-27-62	F	4 days	710	260	78	178	94	45
	M		880	260	74	174	96	51
12-6-62	M		877	242	72	162	102	46
	F		849	232	72	165	99	50
	M		679	230	67	148	90	40

by us when about four days old. At birth the young have longitudinal yellowish or white stripes on a brown background (see Pl. II, Fig. 3). The color of individual litters varies considerably. Some pigs are much darker than others and have less distinct stripes. The stripes slowly disappear as the animals grow and the coat becomes reddish. Little evidence of stripes remains after 24 weeks of age.

#### Behavior

No detailed studies on the behavior of the bushpig have been made. Roberts (1951), Shortridge (1934), Phillips (1926), Ansell (1960b), and other writers all describe the bushpig as a gregarious animal. The herd size has been described by various writers as containing from four to 20 pigs.

Unlike the warthog, which is strictly diurnal, the bushpigs feed almost entirely at night. During the daytime they seek refuge in the tall grass and brush where they remain until darkness. Ansell (1960b) says, however, that in remote country they commonly move about in the daylight when undisturbed.

In captivity young bushpigs become extremely tame but tend to become dangerous as they reach maturity. Among the captives which we raised we found that injured animals were persecuted by their pen mates; the injured pigs had to be separated from the others when cuts or open sores appeared on their bodies.

#### Bushpigs and Trypanosomiasis

No detailed information is available on the species of trypanosomes that may be carried by bushpigs. Some of the animals kept in the current study were infected with a trypanosome, fatal to domestic pigs, by inoculation of blood from a heavily infected domestic pig. Not all the bushpigs became positive for trypanosomes and those that did apparently were not affected seriously. The trypanosomes could no longer be detected in blood smears taken a few weeks after initial infection. This information was given to the authors in a personal communication from P. McKenzie.

Bushpigs infected with trypanosomes, even if only for a short time, act as carriers of the disease, and the frequency with which they are fed on by tsetse flies determines the importance of the animals in the epidemiology of trypanosomiasis. In Rhodesia, *Glossina morsitans orientalis* Vanderplank and *Glossina pallidipes* Aust are the major tsetse species. *G. morsitans orientalis* falls into the group feeding mainly on suids and bovinds (Weitz, 1962), based on information derived from identification of blood meals obtained

from flies in the field. Available information indicates that suids provide 36.1 percent of the meals of *G. morsitans orientalis*, and of the total suid blood meals 14 percent are from the bushpig (Weitz, 1962). *G. pallidipes* falls into the group classed as feeders mainly on bovinds (Weitz, 1962). Suid meals comprise 29.9 percent of the total meals taken by this fly, and of the suid meals 41 percent are from the bushpig (Weitz, 1962). The importance of bushpigs in the diet of tsetse in Rhodesia is established by this data, and in other parts of Africa there are tsetse species which are more partial to bushpig blood.

All the tsetse infested country in Rhodesia falls in the range of distribution of the bushpig (Smithers, 1966), and the ranges of the two major tsetse species are almost identical. Control of tsetse by elimination of preferred host species is attempted in some areas of Rhodesia, and bushpigs are one of the animals hunted.

In January, 1965, and April, 1964, four of the captive animals were used for experimental work with trypanosomiasis. Blood samples from bushpigs inoculated with trypanosomes revealed short periods of infection from which the animals recovered, and weight curves did not appear to be affected by the treatment. Further details on this phase of study will be reported by Phelps and Roth.

#### Food Habits

No detailed study of the foods taken by the bushpig has been made. Fitzsimmons (1920) says that in South Africa they take roots, bulbs, and fruits. Shortridge (1934) agrees but adds that they devour reptiles, eggs, and birds and tells of one instance where the carcass of a bushbuck was eaten by bushpigs. Roberts (1951) says that the normal diet of the bushpig is roots and edible vegetable matter. Phillips (1926) gives a rather extensive list of plants eaten by bushpigs in South Africa. He lists seven species of ferns, nine species of monocotyledons, eight species of dicotyledons, and 26 species under forest tree fruits.

In agricultural areas surrounded by brushy timber the bushpig makes domestic crops a large part of his diet. Maize, groundnuts, and field peas are heavily taken by bushpigs in Rhodesia as the fruits become mature.

#### Control of Bushpigs

Because of their fondness for agricultural crops they are classed as a major pest in the maize growing area of Rhodesia. In these areas farmers find it necessary to control the bushpig by whatever means possible. The animals destroy far



more of the crop than they can eat (Roberts, 1951), and being largely nocturnal in habit, they are not easy to hunt by conventional methods. The most successful method of hunting the animals is the use of dogs to track them to their lairs which are generally in dense thickets. Even when located, the bushpig is not easy to kill, and can be a formidable adversary. Shotguns are the most useful weapon in hunting the animals, the range at which shooting is done being only a matter of yards. Trapping has not been found to be very effective against bushpigs (Roberts, 1951), and once a trap has been located the animals will make wide detours around it. Bushpigs will sometimes eat carrion (Smithers, 1966) and large animal carcasses are sometimes poisoned in areas infested with bushpigs. The animals may occur very close to settled areas, provided some thick cover remains in gullies or on hill slopes. In such areas enough manpower may be available to organize drives, and this method of hunting sometimes achieves a degree of success.

#### ACKNOWLEDGMENTS

We wish to thank the many people who helped us with this study. We want to especially thank Patrick Maratos of Concession who helped gather data. Also William Keats and Richard Peak of Concession, Mr. Wheeler of Mazoe, Mr. Edwards of Salisbury, Mr. Newmarsh of Salisbury, and Mr. Bothma of Umtali who furnished us with young bushpigs. We want to thank R. H. N. Smithers, Director of the National Museum of Rhodesia for his assistance. Also Graham Child, Curator of Vertebrates of the National Museum, who assisted us and allowed us to use data on the museum collections of bushpigs. We wish to also thank E. B. Edney, Head, Zoology Department of the University College of Rhodesia and Nyasaland, for furnishing space to raise young bushpigs. We appreciate the help of Moses Nyamuremba, Michael Katere, and Shadrack Mushambande who cared for the animals. We wish to acknowledge the National Science Foundation for financial assistance on part of the project.

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## EXPLANATION OF THE PLATES

## PLATE I

- FIG. 1. Frontal portion of female bushpig skull.  
FIG. 2. Frontal portion of male bushpig skull  
showing upward extension of maxilla.

## PLATE II

- FIG. 3. Young bushpigs two days old.  
FIG. 4. Adult male captive bushpig.